CLAIMS

What is claimed is:

1. A comb element with closely intermeshing involute surface for a twin-screw extruder with closely intermeshing screws rotating in same direction, said comb element comprising on its involute surface a plurality of surface structure elements which are set back from the involute surface.

2. The comb element of claim 1, wherein the surface structure elements extend inwardly from the involute surface in perpendicular relationship to a tangential direction at a maximum of 5 mm.

3. The comb element of claim 1, wherein the surface structure elements have a surface area of ≤ 2 mm^2 at their tip adjacent to the involute surface.

4. The comb element of claim 1, wherein the surface structure elements have a surface area of ≤ 1.8 mm^2 at their tip adjacent to the involute surface..

5. The comb element of claim 1, wherein the surface structure elements have each a base body constructed to resemble the shape of a member selected from the group consisting of pyramid, truncated pyramid, truncated cone, cylinder, block shape, and combinations thereof.

6. The comb element of claim 1, wherein the surface structure elements have each a base body defined by a bottom and a pointed end, said base body having a cross section which decreases from the bottom face to the pointed end.

7. The comb element of claim 6, wherein the base body is configured of substantial conical shape.

8. The comb element of claim 1, wherein the surface structure elements are arranged at a surface density such as to realize at least 10^8 looping possibilities per area unit of 100 mm^2 for a flexible fiber.

9. The comb element of claim 1, wherein the involute surface is so constructed as to be spaced from an involute surface of a further said comb element at a distance of a maximum of 5 mm, when the comb element and the further comb element are mounted on parallel screw shafts.

10. The comb element of claim 1, wherein the surface structure elements are configured such as to maintain a minimum distance in relation to the surface structure elements of an interacting further said comb element to avoid any cutting action between the comb element and the further comb element.

11. A twin-screw extruder, comprising at least two closely intermeshing screws rotating in same direction for advancing a plastic melt in a transport direction, each of the screws supporting at least one comb element defining an involute surface and comprising on its involute surface a plurality of surface structure elements which are set back from the involute surface.

12. The twin-screw extruder of claim 11, wherein the comb element, as viewed in the transport direction, is arranged downstream of a feed device for introduction of fiber material.

13. The twin-screw extruder of claim 12, wherein the fiber material includes natural fibers.

14. The twin-screw extruder of claim 13, wherein the natural fibers are selected from the group consisting of flax fibers, hemp fibers, kenaf fibers, sisal fibers, coco fibers, cotton fibers and jute fibers.

15. The twin-screw extruder of claim 12, wherein the fiber material includes inorganic fibers.

16. The twin-screw extruder of claim 15, wherein the inorganic fibers are selected from the group consisting of glass fibers and carbon fibers.

17. The twin-screw extruder of claim 12, wherein the fiber material includes aramide fibers.

18. The twin-screw extruder of claim 12, wherein the fiber material has fibers with a mean fiber length of at least 1 mm after a compounding process.

19. The twin-screw extruder of claim 11, wherein each of the screws includes a plurality of said comb element arranged behind one another.

20. The twin-screw extruder of claim 19, wherein the comb elements are arranged on the screw in axial spaced-apart relationship.

21. The twin-screw extruder of claim 12, wherein each of the screws supports a screw element disposed in the transport direction downstream of the feed device for fiber material to realize a coarse distribution of the fiber material, said comb element constructed for implementing a homogenous distribution of the fiber material in the plastic melt.

22. Use of a comb element defining an involute surface and comprising on its involute surface a plurality of surface structure elements which are set back from the involute surface, for separation and incorporation of fibers in a plastic melt.

23. A screw of a twin-screw extruder, comprising a screw body; and at least one comb element disposed on the screw body and defining an involute surface, said comb element comprising on its involute surface a plurality of surface structure elements which are set back from the involute surface.

24. The screw of claim 23, wherein the surface structure elements extend inwardly from the involute surface in perpendicular relationship to a tangential direction at a maximum of 5 mm.

25. The screw of claim 23, wherein the surface structure elements have a tip adjacent to the involute surface and having a surface area of ≤ 2 mm^2.

26. The screw of claim 23, wherein the surface structure elements have a tip adjacent to the involute surface and having a surface area of ≤ 1.8 mm^2.

27. The screw of claim 23, wherein the surface structure elements have each a base body constructed to resemble the shape of a member selected from the group consisting of pyramid, truncated pyramid, truncated cone, cylinder, block shape, and combinations thereof.

28. The screw of claim 23, wherein the surface structure elements have each a base body defined by a bottom and a pointed end, said base body having a cross section which decreases from the bottom face to the pointed end.

29. The screw of claim 28, wherein the base body is configured of substantial conical shape.

30. The screw of claim 23, wherein the surface structure elements are arranged at a surface density such as to realize at least 10^8 looping possibilities per area unit of 100 mm^2 for a flexible fiber.